have been located in the heart of commercial and business districts and have not been offensive. It is quite possible to design incinerators of attractive and pleasing architectural appearance; but it must be admitted that the majority of incinerators thus far constructed in America have been anything but beautiful. A discussion of the features of proper design of such plants is deemed to be without the scope of this paper.

Final Decision as to Method. Data are now available whereby the total and net cost of disposal of refuse by dumping at sea and by incineration can be fairly closely determined, both for the present and for the more or less distant future. These estimates should be carefully made in terms of total necessary investment and capitalized annual charges and in terms of costs per ton. Such a study of costs should be made before any of the communities in question commits itself definitely and permanently to either scheme of disposal. It is apparent that disposal at sea will not be an ultimately available method if the distance to which the refuse must be carried, in order to insure the protection of shores, should be so great as to represent a greater total cost than that incurred by disposal by incineration.

DISEASES OF DOMESTICATED ANIMALS AFFECTING THE PUBLIC HEALTH IN ALAMEDA COUNTY.*

By C. M. HARING, D. V. M., Berkeley.

This paper is to be divided into two parts: the first to deal with specific infectious diseases of animals that are directly transmissible to man; the second part to deal with diseases of domesticated animals which are of importance from a public health standpoint, but which are not directly transmissible to man. An example of the first class is glanders in horses; an example of the second class is mammitis or inflammation of the udder in dairy cows.

Glanders. This is primarily a disease of horses and mules, and is one of the most widely distributed diseases of animals. It exists in nearly all the countries of the world, and in this state is a menace to the horse and mule industry. It is of much significance in this city. During the past two years, more or less systematic efforts have been made by the State Veterinarian to eradicate this infection. Some conception of the prevalence of this disease in California can be gathered from the reports of animals destroyed by various county live stock inspectors and by the state veterinarian. In all, 1991 animals have been examined and tested with mallein, 802 of which were destroyed because they reacted to the test, and 409 were destroyed without test because they showed clinical symptoms of the disease. In Alameda County, twenty-seven animals have been destroyed without test, because when recognized they were in such an advanced stage of the disease that it was evident they were infected with glanders; 158 were tested with mallein on suspicion, 104 of these passed the test, 9 were held for re-test, and 44 were destroyed. In the past two years the value of horses and mules killed for glanders in Alameda County, computing their value at $100 per head, which is a low estimate, was approximately $7,000. Computing the loss in the entire state, the amount was $70,000.

Although glanders seldom occurs in man, it is a disease which is quite generally feared, because in the human it assumes a terrible and rapidly fatal form. It is proper in this paper to mention the most approved methods for its control. Of course, the recognition and destruction of all cases of glanders is the most important measure. Although the clinical symptom of the disease, such as ulcers on the Schneiderian membrane, and "Farcy Buds" in the lymph-nodes of the limbs, are very noticeable, a large proportion of infected horses have an occult form of the disease. These are the cases in which lesions are confined to the internal organs, especially the lungs. It is here that the difficult part of the control of the disease is presented. After testing a number of animals with which a clinical case of glanders has been in contact, we invariably find one or more which react to the mallein test. In many instances these animals appear to be from all external appearances just as healthy as those which passed the test, and it is difficult at times to convince the owner that they are also infected with glanders. Still if these are allowed to live, and constantly come in contact with healthy animals, they are capable of spreading the infection. On account of the opposition of horse owners to the measures necessary to eradicate infected animals from their stables, it is difficult to make much headway against the spread of the disease. The State Veterinarian of California, in his fifth biennial report, advocates an appropriation to reimburse the owners in part for the value of destroyed horses. If this could be done many more cases of glanders would be reported to the sanitary authorities by the owners, instead of being kept hidden, as now happens in many instances.

The abolition of the public watering-trough has been advocated as a means of preventing the spread of this and other diseases of horses. There can be little doubt but what the public watering-trough is a cause of more sickness among horses than is the use of the public drinking cup in diseases of humans. The establishment for horses of public drinking fountains which are under the supervision of some organization that provides for their frequent cleansing and disinfection, is a step in the right direction.

* Read before the Alameda County Medical Society, January 17, 1911.

Other Diseases of Horses. Glanders is the only disease of horses in Alameda County which is a direct danger to humans. There are several infectious diseases which are transmissible to horses as well as to man, for instance, Anthrax. Influenza and contagious "pink eye" of horses have been stated to be a cause of similar diseases in man, but in the opinion of the writer it remains to be proven that these diseases are transmissible to humans. Recently we have received several letters of inquiry concerning anterior poliomyelitis in animals. In the fall of 1909 I visited the State Hygienic Laboratory of Minnesota. Dr. M. H. Hill was at that time investigating some outbreaks of this disease in that state, and he reported a history of the occurrence of paralysis in young domestic animals in communities where cases of infantile paralysis had occurred. I do not know of any cases in animals which I can suspect of being this disease. It is probable that the same thing is occurring now as happened a number of years ago before the discovery of Klebs-Loefler Bacillus, the specific cause of diphtheria. Formerly, many physicians believed that avain diphtheria, or roup, was identical with diphtheria in human beings, but the discovery of the specific etiological factor, B. diphtheriae, proved that to be a fallacy. The fact that paralysis of domestic animals occasionally occurs in localities where there are cases of anterior poliomyelitis is not a good reason for believing that this latter disease also occurs in domestic animals.

Rabies. In the fall of 1909 reports were received at the State Hygienic Laboratory of rabies in Southern California. Heads of some of the suspected dogs were later received, and the disease proved to be rabies. Since that time several hundred cases have been reported. So far as I know, this is the first epidemic of the disease that has occurred in California. The disease has found its way to Central California, several cases being reported from Stockton, some of which have been verified by laboratory diagnosis. One case of proven rabies has occurred in Contra Costa County, and it is probable that in the near future cases of the disease will occur in the Bay Cities.

As rabies, under natural conditions, is only transmitted to man by the bite of infected dogs, the control of the disease rests almost entirely upon ordinances requiring the muzzling of all dogs which are not confined to the premises of their owners. Among other measures which might be mentioned are the destruction of all ownerless dogs and the licensing of all dogs. The Pasteur treatment has been made so effective and inexpensive as compared with former times that, when desired, animals bitten by rabied dogs may be treated.

Tuberculosis in Cattle. Of the diseases of cattle there is perhaps no other that causes as heavy losses as tuberculosis. This affection was known in very early times, but its means of spreading was very limited, owing to the small traffic in cattle. In the nineteenth century it has become, however, a source of great loss, largely because the people did not know its cause or how it was spread.

Bovine tuberculosis, while not characterized as an epidemic or epizootic disease, is estimated to affect ten per cent. of all dairy cattle. The post-mortem examination of the cattle slaughtered in the abattoirs of ten foreign countries furnish figures proving nearly eighteen per cent. to be tuberculous. Dr. A. D. Melvin, Chief of the U. S. Bureau of Animal Industry, estimates, on careful data, that tuberculosis of food-animals cost this country $14,000,000 annually.

In order to determine the extent to which the disease has spread in this region I have collected and compiled the results of a number of tests made by Dr. A. R. Ward and myself during the last four years, but largely in 1907. Among 1,022 cows in twenty-two herds we have found 31.9 per cent. reacting. Eighty-two per cent. of the herds were found to contain infected animals. These figures are compiled only as results of whole herds tested for the first time, and do not include semi-annual tests of herds producing certified milk. Of seventy-one cows pastured on vacant lots in Berkeley eight per cent. reacted. These figures concerning the prevalence of tuberculosis were derived from results obtained largely in herds furnishing milk to the Bay Cities.

Sanitarians have recognized the danger of human infection from the consumption of milk from tuberculous cows, and the presence of much tuberculosis in pigs fed on such milk is a practical demonstration of the transmission of virus through this medium. The conclusion by many investigators is that from one to two per cent. of human tuberculosis, especially the glandular form, is of bovine origin. There is a large literature on this subject. The report of the British Royal Commission on tuberculosis, the proceedings of the Sixth International Congress on tuberculosis, and the reports of Dr. Wm. H. Park, Director of Research Laboratory of New York City Board of Health, are especially recommended for information on the transmission of bovine tuberculosis. Dr. Park, in a paper read before the Pathological Section of the National Association for the Study and Prevention of Tuberculosis, gives the following table of cases examined in his laboratory previous to May, 1910:

Ages of tuberculosis individuals.	Human type.	Bovine type.	% of Bovine type.
Persons 16 years and older.....	296	1	0.33
Persons from 5 to 16 years old..	45	9	16.66
Persons under 5 years of age...	62	22	26.19
Total	403	32	7.12

In a discussion of the paper, Dr. Welch of Johns Hopkins University pointed out that these were not cases especially picked to show that bovine types of tubercle bacilli may cause human tuberculosis.

Anthrax. Anthrax is another disease of dairy cows which sometimes occurs in Alameda County. It is usually confined to swampy land. I do not know of any cases occurring in this county during the past two years, although thousands of cattle die of anthrax every summer in the valleys. I know of the

occurrence of this disease three years ago in a dairy in another county which was shipping milk to Oakland. Several cows died, and one milker became infected with malignant pustules on the hands and arms. The State Veterinarian reports that during August and September, 1909, serious outbreaks of anthrax occurred among the cows in four dairies in Solano County. Two hundred and three cows died from this disease in these four dairies in the course of about two weeks.

Other diseases of animals which are directly transmissible to man and which occur in Alameda County are: actinomycosis, trichinosis, ringworm, and the tapeworms—taenia solium, and taenia sagginatia.

Other Diseases of Domestic Animals. Of the diseases of domestic animals of importance from the public health standpoint but which are not directly transmissible to man, I have already mentioned mammitis or garget in dairy cows, which is a frequent cause of pus in market milk. There is a good deal of pus in market milk, and it is to be regretted that the various methods of counting the leukocytes in milk have not proven reliable as a means of detecting its presence, because the milk from some healthy cows with normal udders contains as high as four hundred thousand leukocytes per cubic centimeter. The presence of streptococci in milk is not necessarily an indication of the presence of pus or other inflammatory products. These organisms are frequently inhabitants of the healthy udder, and form a part of its normal bacterial flora. Actual inspection of the cows by a competent and conscientious veterinarian is the only reliable safeguard.

From a meat inspection standpoint, septicemia, pyemia, hog cholera, and numerous other diseases, are of importance. A very objectionable disease from an aesthetic standpoint is caseous lymph adenitis of sheep. The characteristic abscesses of this infection are frequently imbedded in the muscle and are sometimes discovered only after a roast is placed on the table. When laid open by the carving-knife they are usually the cause of considerable alarm to the layman. Occasionally roasts of mutton containing these abscesses have been submitted to me for diagnosis.

We need more and better veterinarians in public health work. Oakland is especially fortunate in having a skilled man of high standing in this profession in its employ. As our knowledge of infectious disease, hygiene and sanitary science improves the true importance of animal diseases and their relation to the public health becomes more evident. The time is coming when this subject of comparative pathology will have its place in the curriculum of every Class A medical school. Harvard and Cornell have for several years had expert comparative pathologists on the faculty. In the past the standard of veterinary education has been so low that veterinary medicine was little better than a skilled trade, but men are now being graduated from our better veterinarian colleges who can command the respect of the medical profession and rank as specialists in comparative medicine and veterinary science.

College of Agriculture, Berkeley, California, 1911.

NOTES ON SEWAGE DISPOSAL.*

By C. E. GRUNSKY, Dr. Eng.
Mem. Am. Soc. C. E.

Last April the speaker visited the sewage disposal works of Wilmersdorf, a suburb of Berlin. These were represented to be an up to date arrangement and proved to be well worthy of examination.

The day was mild, but cloudy and threatening rain. A moderately strong wind was blowing. On the two mile walk from the nearest railway station, the wind's course was crossed as it blew from the works. It came heavily laden with malodorous gases and the speaker's conviction was speedy and strong that no matter how clear and non-putrescible the effluent from such clarification works might be, the works would be inadequate to meet the requirements for or near any large American city.

At these works, which are known as "Klär-Anlagen," the sewage is received in a circular concrete tank from which it flows to open settling basins. Of these there are four acting on the principle of the septic tank. They are scum-covered and practically odorless except when the sludge is removed by being siphoned to nearby sludge beds. The effluent from the settling basins flows to a chamber, the outlet of which remains closed until the chamber is full, whereupon its overflow fills a bucket attached to a lever and opens the flow to the coke beds of which there are 28 at the works.

Each coke bed is a cylindrical pile of coke with sides practically vertical, about 60 feet in diameter, and about 7 feet high, in the center of which is a riser pipe connecting with two horizontal pipes that extend out to the edge of the coke pile. The horizontal pipes are supported from a central upright extension of the riser pipe by means of iron rods. They are perforated in such a way that the outflow of sewage is proportional to distance from the center toward the periphery of the bed and that this outflow imparts rotary motion to the two arms which swing about a foot above the top of the coke bed, revolving slowly for a few minutes while the bed is being dosed and then remaining at rest until another dose of sewage has accumulated.

The septic sewage thus sprinkled in the open on the coke beds is foul smelling and there seems to be no way in which septic sewage can be handled at such clarification works without giving rise to the bad odors that have long been recognized as one of the great drawbacks to any general application of the septic tank treatment of sewage.

The effluent from the coke beds is turbid, with an abundance of flocculent matter. It is allowed to flow into another set of four tanks, where most of the material in suspension drops to the bottom and the outflow is then ready for discharge into the river. This final effluent is by no means perfectly clear. It still carries some flocculent matter. It is non-putrescible and apparently quite up to the standard usually insisted upon in Germany that it must be at least as free from objectionable matter as the water of the stream into which it is discharged.

The visitor to these works is also shown a field a few acres in extent prepared for irrigation to

* Read before the Alameda County Medical Association, January 17, 1911.